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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/891,611	06/27/2001	Mamoru Nakasuji	010817	8874

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EXAMINER	
BERMAN, JACK I	

ART UNIT	PAPER NUMBER
2881	

DATE MAILED: 03/29/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/891,611	NAKASUJI ET AL.	
	Examiner	Art Unit	
	Jack I. Berman	2881	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 January 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *105-108,110-119,121,122,124-130,136-140,142-144,146,148 and 150* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *118,119,124,126,136-140,146,148 and 150* is/are allowed.

6)☒ Claim(s) *105-108,110-117,121,122,125,127-130 and 142-144* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 October 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 127 and 128 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Both these claims originally contained the limitation "a single aperture plate is disposed in a position deviated toward the side of the source of the electron beam from the position of an image of the beam source formed by a lens of the primary optical system." The amendment filed on January 23, 2006 adds the new limitation "wherein said single aperture plate is disposed around a beam source image." How can the single aperture plate be disposed both "deviated ... from a position of an image of the beam source" and "disposed around" this same image?

Claim 130 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The amendment filed on January 23, 2006 adds the limitation that the positions of the plurality of apertures in an aperture plate disposed so as to correct a distortion of the primary optical system are in a plane perpendicular to the optical axis. There does not appear to be any support for this limitation in the application since, as can be seen in Figure 38 and discussed at pages 185-194 of the specification, the

arrangement of the aperture positions used to correct the distortions specifically locates these apertures in different planes, not a single plane.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 114-117 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 114, the independent claim from which claims 115-117 depend, contains limitations directed to both "one primary optical system with an optical axis" and "one secondary optical system with an optical axis". It is therefore not clear which axis is "said optical axis" in the amendment filed on January 23, 2006. For purposes of examination, the examiner assumes that the optical axis of the primary optical system is "said optical axis" because it is the optical axis along which the particles are irradiated.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 114 and 115 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,892,224 to Nakasuji. Nakasuji discloses an inspection method and apparatus for irradiating electron beam to a sample to inspect the sample, comprising the steps of:

(a) irradiating a surface of the sample with a plurality of primary electron beams (EB11, EB21, EB31, ..., EB36) by a primary electronic optical system with an optical axis that has a function of scanning the primary electron beams simultaneously,

(b) converging secondary electrons generated from each of irradiating points of the a plurality of primary electron beams formed on the surface of the sample,

(c) leading converged secondary electrons toward to a detector by a secondary optical system with an optical axis,

(d) detecting the secondary electrons using a plurality of detectors (M11, M21, M31, ..., M36) so as to introduce them into an image processing system (processor 12) for forming an image by the secondary charged particles and a data processing system (memory 14) for displaying and/or storing a state information of the object to be inspected based on an output from the image processing system,

(e) repeating above steps (a) to (d) while transferring the sample successively (see lines 51-59 in column 16) and precisely positioning the beam on the object to be inspected by measuring a position of the object to be inspected (see lines 61-67 in column 14),

wherein the irradiating points of the primary electron beams are disposed in rows N in a direction of transferring the sample and in columns M in a direction perpendicular to the direction of transferring the sample (see Figures 2(b) and 7). At lines 36-41 in column 9, Nakasuji teaches that the positions at which the plurality of the charged particles are irradiated are separated enough that the secondary charged particles generated by each beam will only be incident on the detector designated for that beam, i.e. the separation of these positions is larger than a distance resolution of the secondary optical system.

Applicant's arguments filed January 23,2006 with respect to these claims have been fully considered but they are not persuasive. Applicant argues:

> Nakasuji only teaches a means for preventing the secondary charged particles from entering into neighboring detectors. Nakasuji does not teach how small the interval can be made concretely.
>
> To the contrary the inspection apparatus defined in claim 114 comprises a feature "wherein the plurality of the charged particle beams are irradiated each around said optical axis at a position separated larger than a distance resolution of the secondary optical system". The above feature of claim 114 limits a concrete physical amount easily obtainable by a simulation or an actual measurement, and limits how small the interval can be made.

This argument is not convincing because, contrary to Applicant's assertion that the "distance resolution of the secondary optical system" constitutes a "concrete physical amount", there is no definition of this term anywhere in the application. It is left as a purely functional definition. Why doesn't the separation of the charged particle beams to positions distant enough to prevent secondary particles caused by a given primary charged particle beam from reaching detectors other than that designated for the given primary charged particle beam constitute a separation that is larger than a distance resolution of the secondary optical system?

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 105, 113, 116, 117, 125, 127-130, 143, 144, and 146 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakasuji in view of U.S. Patent No. 4,954,705 to Brunner et al. As has been explained in previous Office actions, Nakasuji discloses an inspection apparatus for inspecting an object of inspection by irradiating the object of inspection with charged particles comprising:

a working chamber controllable into a vacuum atmosphere for inspecting an object of inspection (not labeled but inherently required because electron beam optical systems only work in a vacuum);

a beam source (1) for generating the charged particles or the electromagnetic wave as a plurality of beams (EB11, EB21, EB31, ..., EB36);

a primary electronic optical system for irradiating the plurality of beams to the object of inspection held in the working chamber, and a secondary electronic optical system, including at least one lens (9), for converging secondary charged particles generated from the object and leading to an image processing system (signal processor 12) which forms an image based on the secondary charged particles;

a data processing system (memory 14) for displaying and/or memorizing a state information of the object based on output of the image processing system; and

a stage system (28) for holding the object so as to be movable relative to the beam,

wherein an electric field for accelerating the charged particle beams is applied between a first stage lens of the secondary optical system and a surface of the object (lines 13-19 in column

9). While Nakasuji irradiates the sample with the primary beams at an oblique angle so as to provide separation between the primary beams and the secondary electrons emitted so that there is more room for detectors, Brunner et al. discloses an inspection apparatus wherein the electronic optical system comprises an objective lens (L2) and an E x B separator (WF), forms a plurality of beams to irradiate the object (see lines 14-22 and 37-48 in column 3), and includes an optical system for accelerating secondary charged particles emitted by irradiation of the beams through the objective lens (see lines 48-51 in column 2), separating the particles by the E x B separator (see Figure 2), and projecting an image of secondary charged particles (see lines 51-62 in column 2), and a plurality of detectors for detecting the image of secondary charged particles (see lines 62-66 in column 2). (The Brunner et al device is also described in Section 3 of the article "Multi-Beam Concepts for Nanometer Devices" by Lischke et al., cited in the Information Disclosure Statement filed on January 18, 2002.) It would have been obvious to a person having ordinary skill in the art to use the electron-optical system disclosed by Brunner et al. to control the multiple electron beams used by Nakasuji when the Nakasuji apparatus is used to inspect semiconductors for defects since the Brunner et al. electron-optical system is designed specifically for this purpose. Brunner et al. teaches at lines 18-49 in column 3 that the plurality of charged particle beams may be formed by either providing a plurality of electron beam sources or an aperture plate that divides a single electron beam into a plurality of electron beams. While Brunner et al. uses the same lenses for both the primary electrons and the secondary electrons, the patent explicitly teaches at lines 56-64 in column 3:

> "Further lenses can be provided in the described electron beam measuring instrument in order to achieve the necessary demagnification of the primary electron source or, respectively, magnification of the secondary particle source.

> Of course, it is also possible to separate the electron-optical beam paths of primary particles and secondary particles and to provide imaging elements for each beam path."

Nakasuji further teaches, at lines 13-62 in column 11, that when the plurality of electron beams are formed by means of an aperture plate between the electron source and the sample, the position of the single aperture plate in the direction of the optical axis should be disposed so as to minimize the difference in beam strength of the beams to be delivered from each aperture to the surface of the sample. At lines 41 in column 12 through line 41 in column 13, Nakasuji also teaches to provide a second multi-aperture plate with a plurality of apertures disposed in front of the detector wherein the positions of the apertures formed in the second multi-aperture plate are arranged so as to correct a distortion in the secondary optical system.

In the amendment filed on January 23, 2006, the limitation that a deflector is provided between the separator and the detectors was added to claims 105 and 125. Since Nakasuji teaches to provide deflectors (16a, 16b, 16c in Figures 4 and 5) to more accurately direct the secondary electrons to the detectors, it would have been obvious to a person having ordinary skill in the art to provide such deflectors in the Nakasuji/Brunner et al. apparatus discussed above in order to achieve the detection efficiency taught by Nakasuji.

Claims 106-108 and 111 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakasuji in view of Brunner et al. as applied to claims 105, 113, 116, 117, 125, 127-130, 143, 144, and 146 above, and further in view of U.S. Patent No. 6,344,750 to Lo et al. for the reasons explained in the previous Office action.

Claims 110 and 112 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakasuji, Brunner et al., and Lo et al. as applied to claims 106-108 and 111 above, and further in view of U.S. Patent No. 4,911,103 to Davis et al. for the reasons explained in the previous Office action.

Claims 121, 122, and 142 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,430,292 to Honjo et al. for the reasons explained in the previous Office action.

Applicant's arguments filed January 23, 2006 with respect 121, 122, and 142 have been fully considered but they are not persuasive. Applicant argues that Honjo et al. does not locate the apertures used to divide the electron beam from the electron gun into a plurality of electron beams "within a range of predetermined current density of the charged particles emitted from the beam source"; however, in the argument, Applicant confuses two separate embodiments of the Honjo et al. apparatus. Applicant argues at pages 25-26 of the amendment:

> Honjo et al. only discloses "electron beam generating units can be arranged in a single dimensional direction or in two dimensional directions (column 9 lines 30-32). What is disclosed in Figs. 10a and 10b is "B1, B2, B3, B4 - - Bn are irradiated simultaneously" (column 9 lines 40-41), "each individual electron beam generating unit 25 may be designed to scan its respective electron beam B 1, B2, over a predetermined region by the deflection electrode 103" (column 9 lines 49-52), and "an electron beam injected from the electron gun 21 and having an uniform diameter formed by the optical system 22 is caused to pass through a predetermined number of electron beam" (column 10 lines 49-52).

However, as the examiner explained in the previous Office action, the embodiment illustrated in Figures 10(a) and 10(b) is discussed at line 63 in column 9 through line 21 in column 10 and comprises an electron beam of uniform diameter, and therefore inherently a "predetermined current density", being divided into a plurality of electron beams by a plurality of apertures

(beam passing holes 111) in an aperture plate (fine construction substrate 110). Lines 40-52 in column 9, upon which Applicant's argument is based, are directed to an embodiment of the Honjo et al. apparatus using a plurality of electron beam generating units 25 to generate a plurality of electron beams, as is illustrated in Figure 8. This embodiment was never the basis of the rejection and is irrelevant to the discussion.

Claims 126, 136-140, and 148 are allowed for the reasons explained in the previous Office action, as is new claim 150, which depends from claim 140.

Claims 118, 119, 124,and 146 are allowed.

The following is a statement of reasons for the indication of allowable subject matter: As Applicant argues, the prior art does not teach to separate the secondary charged particles from the primary charged particles after they pass through the objective lens and before they enter the next lens.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jack I. Berman whose telephone number is (571) 272-2468. The examiner can normally be reached on Monday-Thursday (8:30-7:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R. Lee can be reached on (571) 272-2477. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jack I. Berman
Primary Examiner
Art Unit 2881

jb
3/22/06